

Modeling Social Influence in Large Populations

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MOVES Research and Education Summit 2010
Session 1
13 July 2010

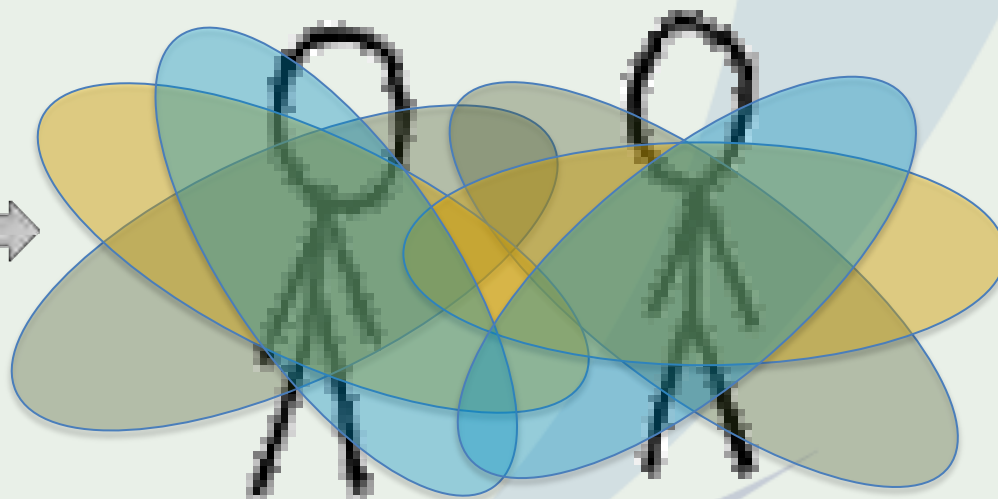
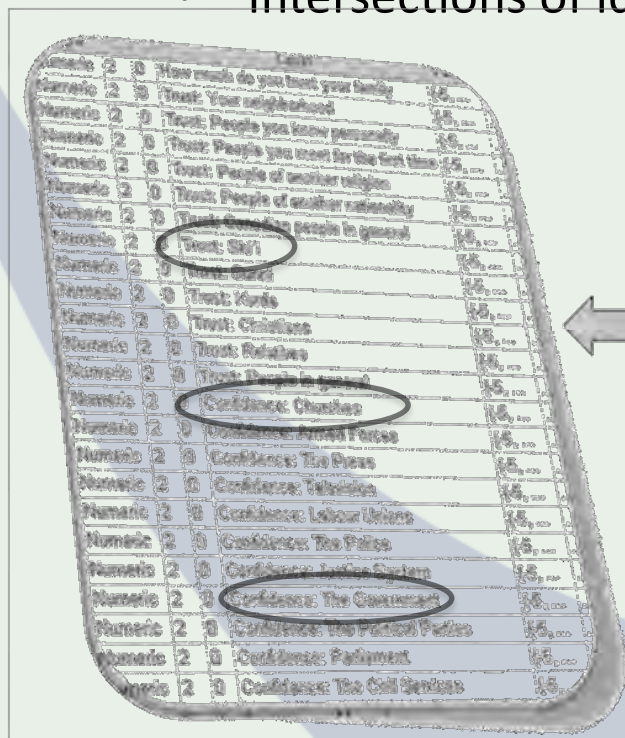
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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 13 JUL 2010		2. REPORT TYPE		3. DATES COVERED 00-00-2010 to 00-00-2010	
4. TITLE AND SUBTITLE Modeling Social Influence in Large Populations				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School,MOVES Institute,Monterey,CA,93943				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 10th Annual MOVES Research and Education Summit 2010, 13-15 July.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 9	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Theory and Introduction

Theory: human collectivities are composed of individuals with different meaningful identities, and these identities form the basis for meaningful interaction, realized within a model “ecology” of identities.

- Homophily , Ecology of Identity, and Cross-Cutting Social Circles: Peter Blau (1994, 1997, etc...), Miller McPherson (1991, 2001), Lynn Smith-Lovin (2009), *et al.*
- Intersections of identities give rise to meaningful interactions:

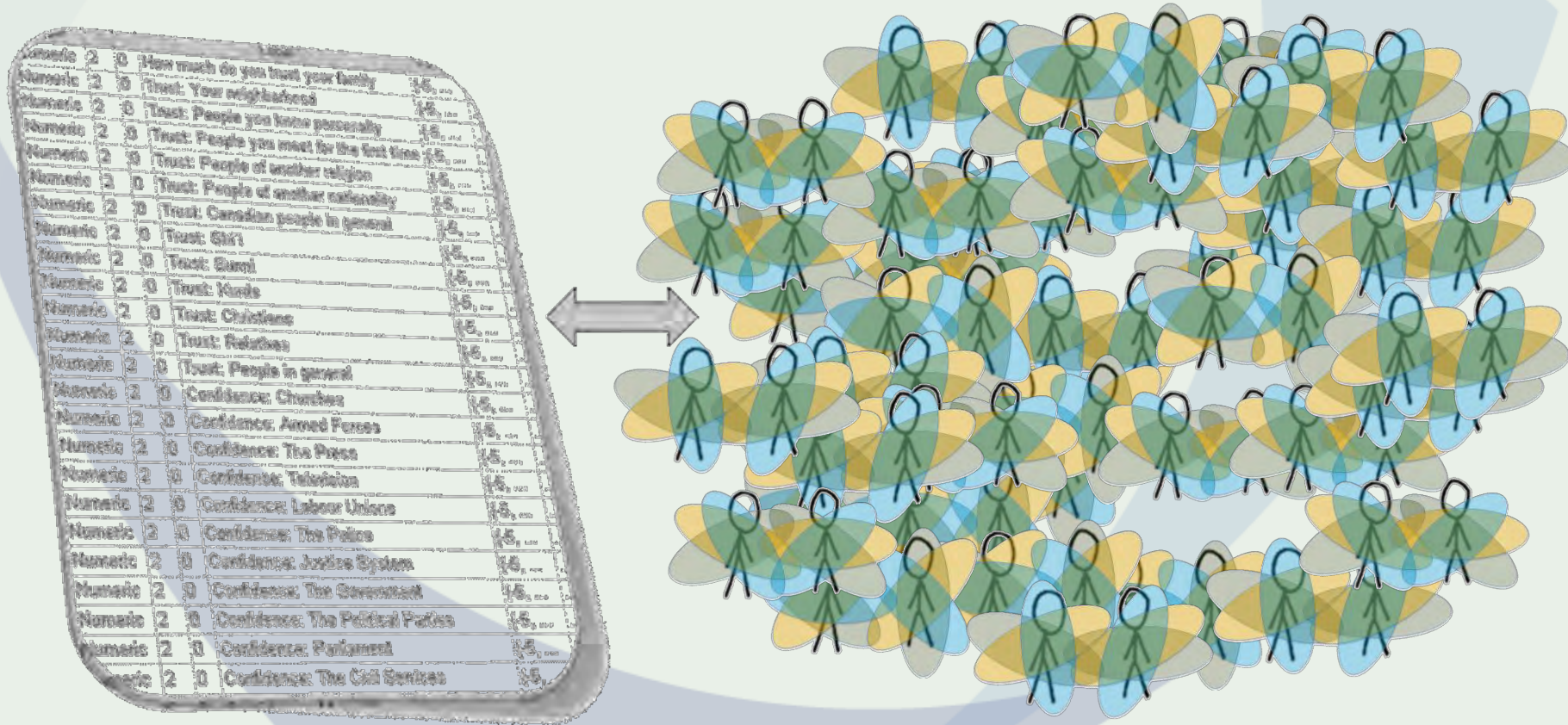


Intersecting dimensions of identity-driven trust and confidence for two individuals (obtained via self-report).

Large Population Structure

Society level structure is calculated by mapping all pair-wise relations on to the distributions of social factors present in the collectivity, accounting for the impact of variance between dimensions.

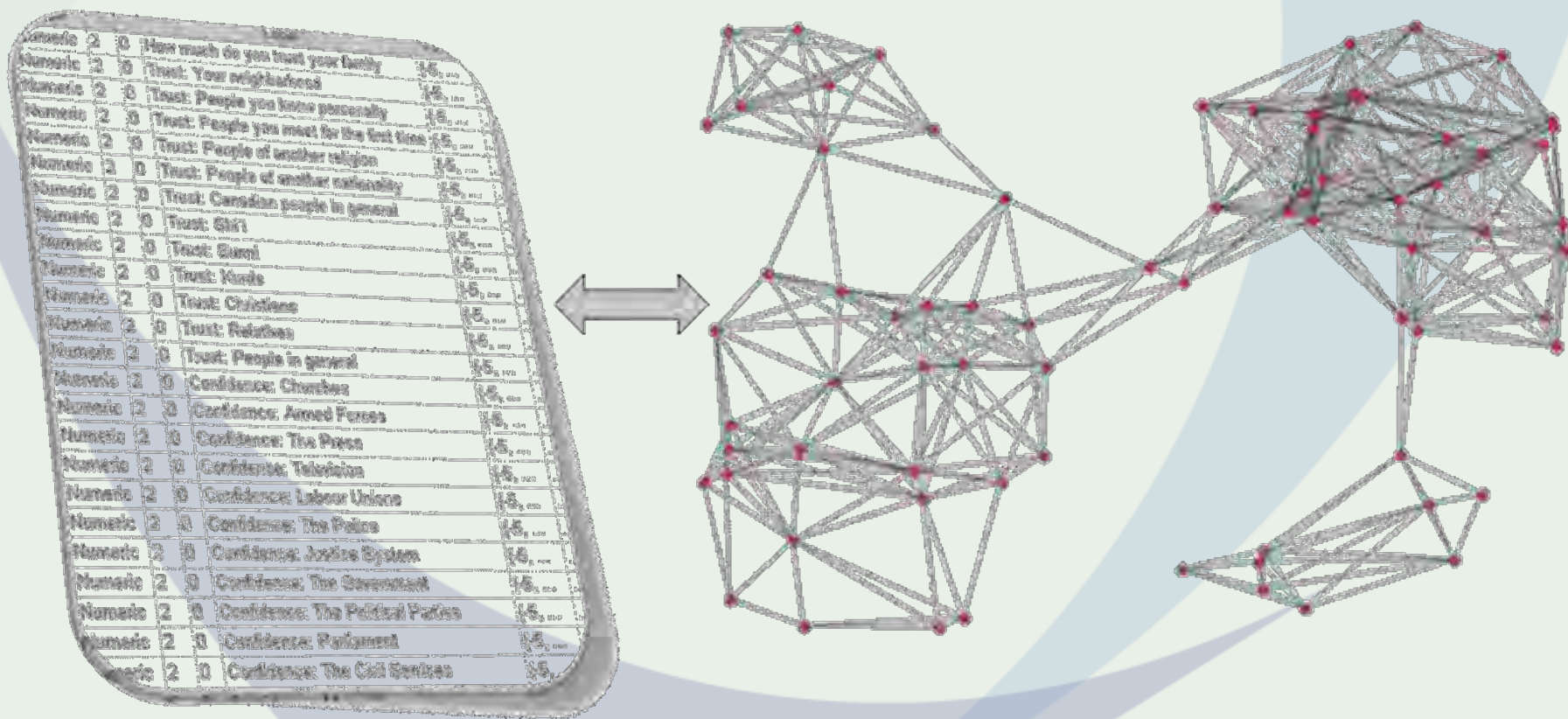
- Social structure is represented as a social network of probabilistic meaningful interactions:



Population Network Model

Society level structure is calculated by mapping all pair-wise relations on to the distributions of social factors present in the collectivity, accounting for the impact of variance between dimensions.

- Social structure is represented as a social network of probabilistic meaningful interactions:



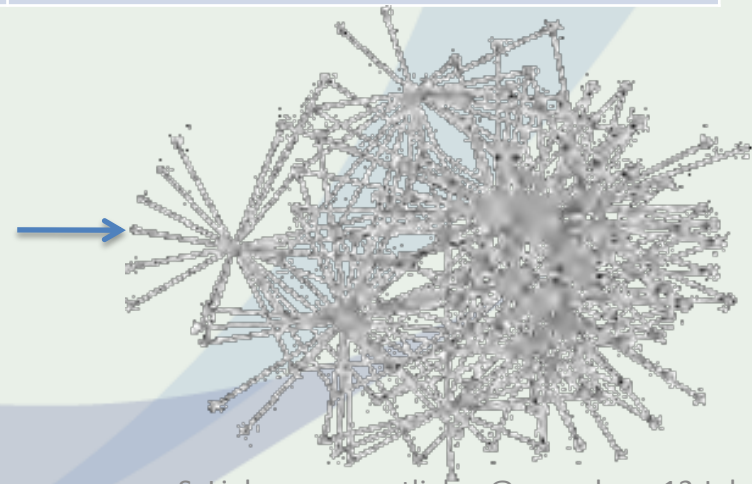
Communication Networks

Communication networks are simulation output that represents the actual communications and influence in a multi-agent system

Population Networks	Communication Networks
Simulation Input	Simulation Output
Instantaneous representation of the distributions of social factors in a populations	Intrinsically represent a window of time (e.g., before, after, or during a simulation event)
Constructed via a theory to model translation of a system based on empirical observations	Ground truth representation of meaningful communications, and inter-agent influences.

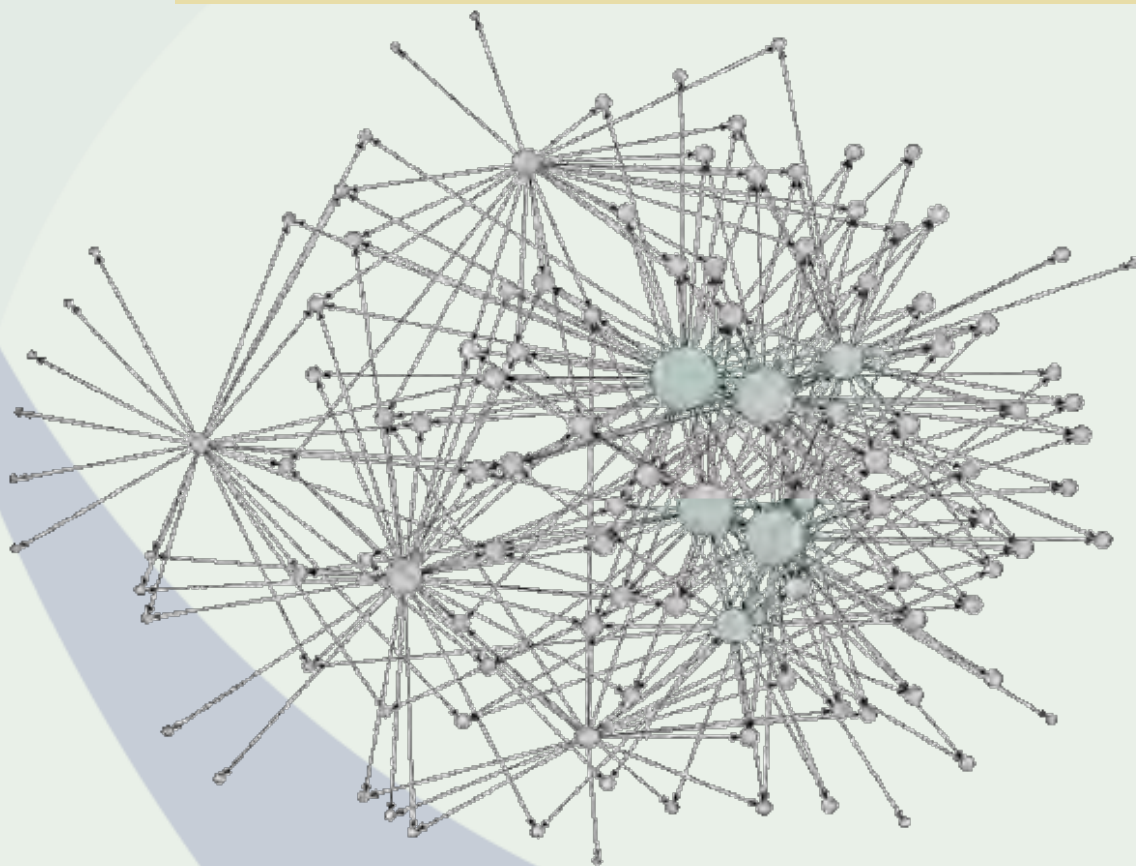
time	logger	entity	agentName	sendingAgent	Value
21.36	Elections	Agent	M_E_ND_A_1	NM_NE_ND_A_4	0.57
24.04	Elections	Agent	M_E_ND_A_1	NM_NE_ND_A_4	0.55
41.26	Elections	Agent	M_E_ND_A_1	M_NE_ND_A_8	0.53
100.5	Elections	Agent	M_E_ND_A_1	M_E_ND_B_1	0.52
363.4	Elections	Agent	M_E_ND_A_1	M_E_S_A_2	0.49

Cultural Geography MAS Output



Mapping Social Influence

Directed (pair-wise) influence, as well as each agent's global influence contribution to the MAS can be visualized and analyzed.



Inter-agent influence network for small time window following an exogenous simulation event, nodes sized by eigenvector centrality

- Communication networks are *directed* (i.e., have a sending agent and a receiving agent).
- Can be *weighted* to represent communication frequency, reciprocity, and combinations of other model parameters.
- Directed and weighted networks allow for much deeper modeling and analysis of influence in large populations.
- Analyzing population networks and communication networks *together*, can address a wide range of important questions related to the dynamics of influence flow and the spread of information (e.g., for information/psyop campaigns).

HSCB Modeling at MOVES

See the full presentation at
Session 4: HSCB Modeling: 0815-0945,
Wednesday, July 14 (Tomorrow Morning!)
Mechanical Engineering Auditorium

See the HSCB demo at
MOVES Demo Night: 1630-1830,
Wednesday, July 14 (Tomorrow Night!)
Watkins Halls, Room WA-275/285

Questions, Comments?



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